QUALITY DIFFERENCES IN ALFALFA SEED MARKETED IN THE WEST

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PREFACE

Alfalfa seed prices frequently vary by as much as $15.00 per hundredweight.

The purpose of this study was to analyze differences in quality of certified and noncertified alfalfa seed in order to provide the basis for establishing improved sales practices and equitable price relationships and to enable the seed user to select seed having a favorable quality-price relationship.

All of the information on quality available to a potential buyer was analyzed in this study. The research is a part of the Department's broad program designed to increase marketing efficiency of farm products.

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SUMMARY

Quality factors of alfalfa seed that are listed on the analysis tag do not vary significantly between certified and noncertified seed. Variation in quality within these two groups is also small.

Nearly all certified alfalfa seed, regardless of origin, meets the highest certification standards established for germination, purity, inert matter, other crop seed, and weed seed. Furthermore, only small differences in quality were noted in the seed grown in 1955, 1956, and 1957.

There appears to be a slight tendency for those States having the highest certified standards for alfalfa seed to market seed of higher quality. But the States with lower standards could market seed of equal quality by more careful processing.

Average measurable quality of noncertified alfalfa seed is lower than that of certified alfalfa seed, but about half of the noncertified seed is equal to or better than the highest standards established in any State for certified seed. If noncertified "common" alfalfa seed had been excluded from this analysis, undoubtedly this proportion would have been increased. More significant are the variations from the average. Each quality factor analyzed varied somewhat more for the noncertified than for the certified alfalfa seed. There is a rather high degree of uniformity in noncertified seed, considering that it is produced without any official seed standards and that the quality of the seed marketed is the decision of individual firms.

Among the factors responsible for the rather high degree of uniformity in the measurable quality of noncertified seed are the strong competitive structure of the seed industry and the presence of certified seed in the marketing system.

It was found that the Pacific Coast area marketed certified and noncertified alfalfa seed of somewhat higher quality for nearly all measurable factors analyzed than did the other geographical areas studied.

Despite the rather high degree of uniformity of certified and noncertified alfalfa seed, two immediate areas could be adjusted and improved:

(1) The certification standards could be more closely alined among the various States. Also more nearly complete standards could be drafted for noncertified seed. These standards could include maximum levels for inert matter, other crop seed, and weed seed, and minimum levels for pure seed and germination.

(2) Since the level of measurable quality can be controlled by processors, varietal purity is one of the primary factors that account for the price differentials in alfalfa seed. An analysis of seed samples at Purdue University indicates that some of the alfalfa seed sold each year is not of the variety designated on the tag. Similar analyses and accurate

tagging of seed marketed in other areas of the country would seem to offer considerable assistance to the seed purchasers.

Trueness-to-type, verified origin, and product differentiation therefore are much more important in explaining differences in alfalfa seed prices and quality than are the slight differences discovered in the measurable quality items which appear on the tag.

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INTRODUCTION

The production and use of alfalfa seed have more than doubled since 1943. Total alfalfa seed production increased from 64.3 million pounds in 1943 to 152.1 million pounds in 1958. The production of certified alfalfa seed also increased during this period from a negligible 31,400 pounds to 60.2 million pounds, a tremendous increase.

Among the factors responsible for this increase were the development of new and improved varieties of alfalfa seed, the introduction of the Soil Bank program, advanced production technology, opening of large areas of newly developed irrigation acreage, increased use of alfalfa for hay and pasture, and new processing and feeding techniques.

The rapid growth in the use of new and improved varieties of alfalfa has helped to develop specialized areas of seed production outside the areas where alfalfa is grown. These specialized areas offer a more constant supply of alfalfa seed than the somewhat erratic production of seed in areas where alfalfa is grown primarily as a hay crop.

With the growing interest in specific varieties for planting in specific areas, the average purchaser is becoming increasingly concerned about the variations in quality of certified and noncertified alfalfa seed entering the marketing channels.

Every potential purchaser of alfalfa seed, if he buys seed in the normal marketing channels, can determine from the tag accompanying the bag the percentage of germination, pure seed, crop seed, weed seed, and inert matter. The tag also indicates whether the seed is certified or noncertified, or has or has not a brand name. It may also show the variety.

The purchaser can be reasonably sure that the information on the tag is accurate except for variety designation. Variety is one of the most important factors of seed, yet the average purchaser can learn little about it from the

tag. There is no definite assurance that the seed in the bag is of the variety specified on the tag. 1/ In view of the lack of reliable information on this subject, about the only criteria available to facilitate the buyer's decision as to which seed he should purchase are the quality items shown on the tag and his past experience with certified or noncertified, brand or nonbrand seed.

Many members of the seed trade and other advisory groups advocate the purchase of alfalfa seed by the certified tag. Others emphasize that tremendous quality differences exist between the various "lots" of seed sold under the certified tag, implying that a buyer should investigate the quality of other types of alfalfa seed also. 2/

This publication will attempt to provide a better understanding of the quality differences which are present in all certified and noncertified alfalfa seed sold in the normal marketing channels and to determine which factors are most influential in explaining seed price differences of as much as $15.00 per hundredweight. Farm-to-farm sales are not analyzed in this report.

All information on quality of seeds that is available to a potential seed buyer is analyzed. If these data indicate any significant uniformity, it is reasonable to assume that the unmeasurable true-to-variety factor, verified origins, and product differentiations are important to the seed purchaser and must explain most of the price premiums that are paid for certain alfalfa seeds. In this event, alfalfa seed marketing would be greatly improved if a reliable and practical method of true-to-type testing could be adopted by the alfalfa seed industry.

METHODOLOGY

In 1957, 16 States produced certified alfalfa seed, all in the western half of the United States (fig. 1). The data summarized in this study were obtained from 12 of these States from records of field inspection and seed laboratory analysis for both certified and noncertified alfalfa seed. 3/ This study excludes registered and foundation alfalfa seed.

1/ Purdue University Agronomy Department in cooperation with the Indiana State seed inspectors planted 91 alfalfa seed samples labeled Ranger at the Purdue Agronomy farm. "Of the alfalfa samples planted in the spring of 1956, fifty-three were labeled as certified Ranger. All of these samples so labeled were classed as true to type except two which are under investigation at the present time; however, of the noncertified Ranger samples planted, fifteen were judged to be seriously off type." Quackenbush, F. W., and Carter, A. S., Inspection of Agricultural Seeds. Inspection Report 8, Purdue University Agricultural Experiment Station, Lafayette, Ind. April 1958. p. 14.

2/ A "lot" of seed is a quantity of convenient size for marketing; it represents no specific amount.

3/ The travel time required to reach the four States excluded from the study was prohibitive, in view of the small amount of seed they produce.

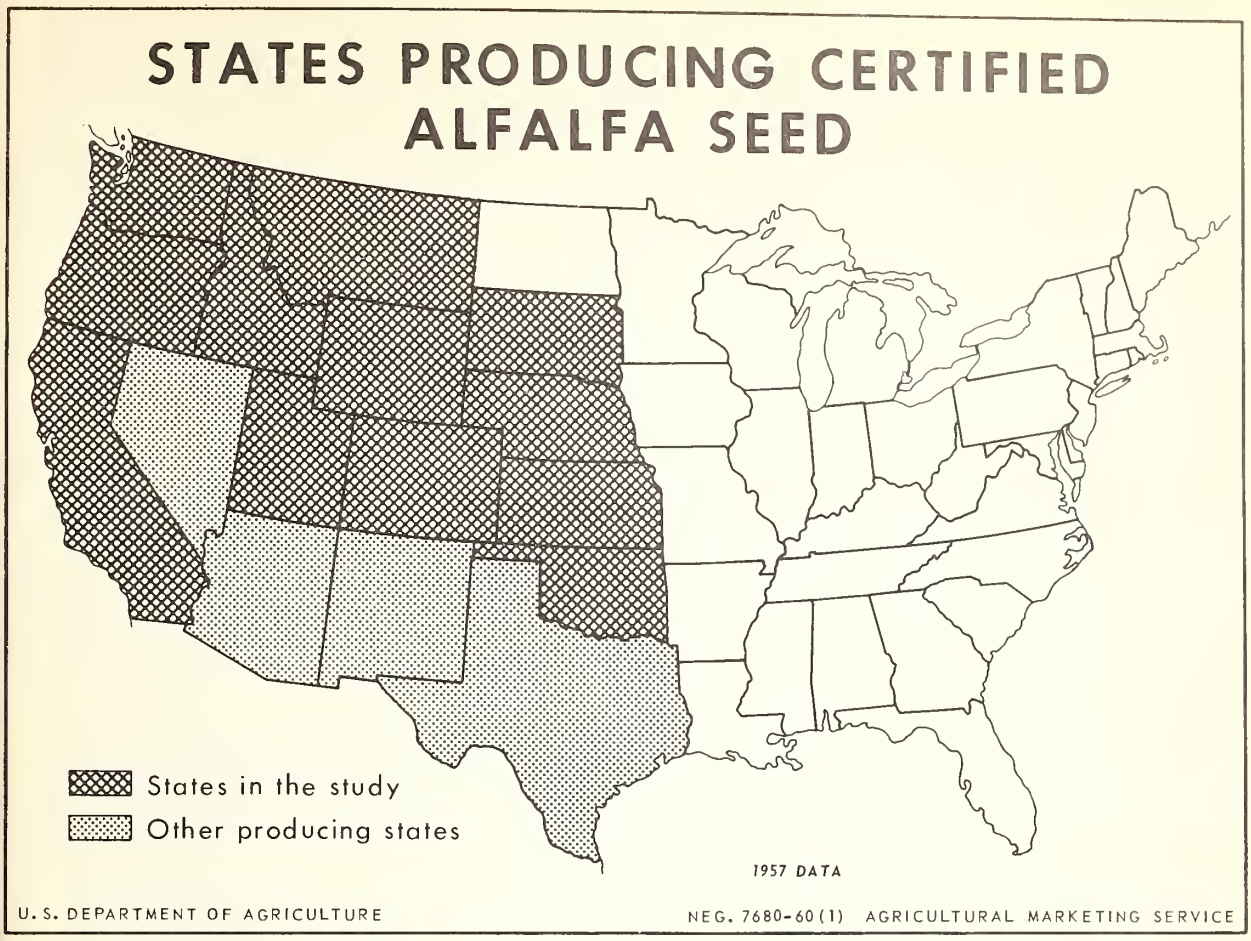

Figure 1

The 12 States visited represent a compact geographical area and accounted for 92 percent of the total alfalfa seed production of the United States in 1957 and 97 percent of the alfalfa seed reported as certified. 4/

The data collected from these States correspond to that available in the market to the average consumer. That is, the same information can be found in detail on the tag of every bag of alfalfa seed marketed in the regular marketing channels.

Field inspection and laboratory analysis data of certified seed samples, for 1955, 1956, and 1957 were obtained from the respective State crop improvement associations.

4/ U. S. Agricultural Marketing Service, Crop Reporting Board. Seed crops--Alfalfa Seed Forecast. October 7, 1958.

Hill, Susanna E. Report of Seed Certified 1957 by State Certifying Agencies. U. S. Agr. Res. Serv. in cooperation with State seed certifying agencies. No date. 81 pp. (Mimeographed.)

The laboratory analysis consists of testing the seed for purity, germination, disease, and noxious weed seed content. Representative samples of seed to be marketed are examined and the results are given to the responsible party, along with tags if the seed passes certification.

Data from the analyses of noncertified seed produced in 1957 were obtained from the respective State seed laboratories. These records contain the results of laboratory analyses of service and official samples.

The service samples of seed generally were submitted by the grower who wanted this information for his own use, although processors of seed also take advantage of this service. Results of the analysis are given to the individuals for their information.

State inspectors draw the official samples from all lots of seed offered for sale by the wholesale and retail establishments they visit. The primary purpose of taking this sample is to prevent the sale of mislabeled seed. Each sample is analyzed and the analysis is compared with the information that appears on the seed tag. If there is a discrepancy, necessary action is initiated by the proper authorities, usually a stop-sale order. This seed cannot be sold until the information on the tag conforms with the new analysis.

Most of this report pertains to official noncertified and to certified seed samples because both types of seed move through similar channels of the marketing system. In many States a considerable proportion of the seed analyzed in the service sample never reaches the normal marketing channels or does so only after additional cleaning or blending.

The laboratory analyses of certified samples and of official or service samples were obtained from the office records and were sampled on the following basis, beginning with a random number:

Certified Seed Sampling

From 7 States with less than 200 sample-analysis records.....all records

From 4 States with 200 to 499 sample-analysis records..every second record

From 1 State with more than 1,500 sample-analysis records.....every tenth record

Noncertified Seed Sampling

From 3 States with less than 200 sample-analysis records.....all taken

From 7 States with 200 to 499 sample-analysis records..every second record

From 1 State with about 600 sample-analysis records.....every third record

From 1 State with about 800 sample-analysis records....every fourth record

A uniform standard for alfalfa seed was created in order to establish a norm with which to compare the quality data for both certified and noncertified alfalfa seed. The basis for this uniform standard is the certified alfalfa seed standards of all the States included in this study. From these individual State standards the highest minimum standard for purity and germination and the lowest maximum standard for the other categories of analysis were used.

No attempt was made to group the data for the noncertified alfalfa seed into uniform types as it would have required a great deal of judgment to attempt to indicate, for instance, that a sample represented a brand-name seed or came from a specified area. An unknown bias could have occurred if this judgment had been involved in the study. This study specifically deals with the quality differences between certified and noncertified alfalfa seed and not with differences between certain types of alfalfa seed. This analysis assumes that all alfalfa seed competes and that the reader will recognize that certain brands and varieties of noncertified seed will compare even more closely with certified seed than the average or the variation for noncertified seed would indicate.

CERTIFIED SEED STANDARDS

Certified alfalfa seed is the progeny of foundation, registered, or certified seed as permitted by the individual State crop improvement associations. The production and testing of this seed must conform to the State seed certification standards.

States that certify seed issue handbooks setting forth general standards and requirements for seed certification. These standards are established to maintain and make available to the public high quality seed of improved varieties, so handled as to attempt to insure varietal purity. Through this program the purchaser has some assurance of getting the variety and quality of alfalfa seed desired although no guarantee is issued by the certifying agencies.

Field Inspection Requirements

Field inspection is a very important requirement of certified alfalfa seed production. A field, to be approved, must meet all of the specifications as set forth in the certification standards, which are essentially the same for all States. 5/ For a field to qualify, the standards specify that it must:

(1) Be planted from seed produced from accepted foundation, registered, or certified stock which has been handled in a way to maintain genetic identity and purity.

5/ See seed certification handbook for various States, 1958 editions.

(2) Not have had alfalfa planted or grown on it for a certain period of time unless it was planted with certified seed of the same variety.6/

(3) Be free from volunteer plants and noxious weeds and relatively free of secondary weeds and clover at the time the seed field is established.

(4) Have no manure applied during the seed establishment or production period.

(5) Be isolated 10 to 20 rods, depending on the crop, from fields of any other variety or fields of the same variety that do not meet varietal purity requirements.

The rules and regulations on field inspections are established by the growers and are supervised and enforced by State seed certifying agencies. However, the full responsibility for approval of the acreage for growing certified alfalfa seed rests upon the field inspectors. 7/ These men are technically trained and must be able to determine immediately, among other things, if there are any noxious weeds present and if the type and amount of the other crops and secondary weeds are within the established limits.

Some of the State seed certifying agencies are restricted in their operations by the amount of financial aid received. The procedure of acquiring the necessary operating budget varies in the different States. In some States these agencies are self supporting, or practically so, while in other States they depend upon financial aid from various institutions or Government agencies.

Field Inspection Findings

In 1957, 90 percent of the inspected acreage received final approval to produce alfalfa seed under the certification program (table 1). The remaining 10 percent was rejected. In many States, however, the term "rejected acreage" also includes acreage withdrawn from the certification program before the final field inspection, acreage cancelled as a result of cutting the alfalfa for hay, and acreage destroyed for various reasons. For example, Utah shows 42 percent of its total acreage rejected. Of this amount, a little more than one-half was either cut for hay or plowed under. The most important reason for cutting or plowing under is poor stand of alfalfa. Other reasons for plowing under include maintenance of a proper crop rotation, unfavorable outlook for seed prices and yields, and expected higher returns from other crops.

6/ Restrictions as to the length of time a field must not have had alfalfa grown on it before the present stand varies with the individual State certification rules. Most States require a 2-year period of no alfalfa grown, unless certified seed of the same variety was used. Several States, however, require a 3- or 4-year waiting period.

7/ These men also act in the capacity of public relations representatives for the State seed certifying agencies which are often called State crop improvement associations.

Table 1.--Acreage applications, approvals, and rejections for the 1957 certification program for alfalfa seed 1/

State	Application for certification	Approved		Rejected 2/	
		Total	Percentage	Total	Percentage
	Acres	Acres	Percent	Acres	Percent
California	139,727	128,677	92	11,050	8
Utah	10,938	6,376	58	4,436	42
Washington	16,517	14,448	87	2,069	13
Oregon	5,775	4,774	83	1,001	17
Idaho	22,910	20,157	88	2,763	12
Kansas	799	799	100	0	0
Montana	14,609	14,609	100	0	0
Nebraska	2,268	2,012	89	256	11
Oklahoma	2,949	2,220	76	729	24
Wyoming	13,697	12,652	92	1,045	8
South Dakota	2,593	2,553	98	40	2
Colorado	1,316	1,316	100	0	0
Total	234,098	210,593	90	23,389	10

1/ Includes seedling, foundation, certified, and registered acreage.
2/ Acreage rejected for all normal reasons plus acreage that produced no seed.

The principal reason acreage was rejected by the field inspectors in nine States was insufficient isolation; noxious weeds, other crops, and volunteer growth were also important factors.

State Laboratory Seed Standards

The respective State seed certification standards do not appear to vary much but there are significant differences (table 2). Some of the measurable quality factors analyzed in the laboratories are in close accordance in all States, but some factors show a wide variation. The largest variation is found in the categories of pure seed and inert matter. The category of discolored seed is a recent addition to the standards in two States. This was added because discoloration of alfalfa seed influences the buying and selling by the seed marketing agencies, who either have it certified, blend it, or use it in a brand-name seed.

Table 2.--State standards for certification of alfalfa seed, 1958

State	Pure seed 1/	Inert matter 2/	Sweet-clover seeds 3/	Other crop seeds 2/	Weed seeds 2/	Discolored seed 2/	Primary noxious seeds 3/	Secondary noxious seeds 3/	Germination 1/
	Percent	Percent	Number per pound	Percent	Percent	Percent	Number per pound	Number per pound	Percent
Kansas	98.00	2.00	9	0.05	0.10		0	0	85
Colorado	98.50	1.50	180	.50	.50		0	0	85
Oregon	99.00	1.00	90	.50	.50		0	45	80
South Dakota	99.00	1.00	160	.50	.50		0	0	80
Idaho	99.00	1.00	180	.25	.25		0	18	85
Washington	99.00	1.00	90	.25	.25		0	18	85
Nebraska	99.25	.75	180	.50	.50		0	27	80
Oklahoma	99.25	.75	0	0	.50		0	9	85
Utah	99.25	.75	90	.10	.20	10.0	0	45	90
Wyoming	99.50	.50	90	.50	.50		0	0	85
Montana	99.50	.50	90	.10	.30	8.0	0	0	85
California	99.50	.50	90	.10	.20		0	4/	85

1/ Minimum percentage allowed.
2/ Maximum percentage allowed.
3/ Maximum allowed per pound.
4/ Melilotus species -- maximum of 90 seeds per pound.

Source: Reports on rules for certification of alfalfa seed published by State crop improvement associations.

Laboratory Findings

From the original sample of 12 States, 7 had usable records. These data show the total volume of seed represented by the sample, and the percentage of the samples and of the volume that was passed for certification.

For these seven States, an average of 82 percent of the total seed samples, representing 90 percent of the volume submitted, were passed for certification in 1957 (table 3). Thus the 18 percent of the samples rejected represented only 10 percent of the total volume of alfalfa seed submitted for certification in 1957.

The number of samples passing certification in the different States ranged from a low of 53 percent to a high of 92 percent of the total number of samples tested. These samples represent lots of seed varying greatly in volume--from 20 pounds to 160,000 pounds. 8/

Volume of seed passing certification in the various States ranged from a low of 139,000 pounds to a high of 1,557,000. The smaller volume represented 33 percent of the seed submitted in that State and the larger volume represented 98 percent of the seed submitted.

Although a large quantity of seed may be rejected for certification on the first presentation in some States, due to excess weed seed, inert matter, or other factors, this seed is in most cases recleaned and resubmitted for certification a second and sometimes a third time. It also may be blended with other certified seed of higher quality or sold as noncertified seed. The experience of seed producers or processors usually enables them to determine how much cleaning is necessary to obtain certification for any one lot of seed. Thus, the number of resubmissions is kept at a minimum.

Yearly Variation

The simple averages of the analyses of purity and germination for certified alfalfa seed do not vary appreciably from year to year in States having the same purity standards (table 4).

Purity and germination analyses showed little change in either the averages or the grouping of the data around these averages in States with similar standards during the 1955-57 period. The two-thirds range for all States over the 3 years was from 99.5 to 99.7 percent for purity analysis and from 86.2 to 97.0 percent for germination. 9/ There appears to be only a slight tendency for States having the higher standards to produce seed with a higher average level of purity than States having the lower standards.

8/ It is doubtful that the quality of such a large volume as 160,000 pounds can be accurately determined by the analysis of one sample. This is true even if the responsible party makes a conscientious attempt to draw a representative sample. It might be well for interested members of the seed industry to initiate a program to determine a maximum amount of seed that any one sample can represent.

9/ See footnote 2, table 4.

Table 3.--Alfalfa seed submitted for certification and percentage of volume and of samples approved, selected States, 1957

States	Total volume submitted	Certified	
		Volume	Samples
	1,000 pounds	Percent	Percent
1	63,149	91	92
2	1,557	98	82
3	1,317	79	70
4	890	76	72
5	597	85	80
6	139	33	53
7	69	95	88
Average	67,718	90	82

The States with the higher purity standards also tend to have the higher average level of germination, even though purity does not have any direct effect on germination.

This analysis of the 1955-57 data for certified alfalfa seed implies that an analysis of data for 1 year or an average of the 3 years will yield similar results (table 4).

Seed Meeting Highest Standards

The average analysis of the certified seed samples in each State for a 3-year period was in most cases above the most rigid specifications in effect in any State (table 5). The greatest variation was found in germination. With the highest standard for minimum germination being 90 percent, the State averages ranged from a low of 90.7 percent to a high of 94.5 percent.

Other crop seed present in the seed ranged from a negligible amount for several States, to a high of 0.03 percent in one State. Weed seed and inert matter approached, and in one instance exceeded, the maximum percentage allowed. However, in most of the States the quality of the certified seed marketed met the highest required standards by a substantial margin.

Most of the certified seed marketed would pass the most rigid existing standards if uniform seed standards were adopted by all States (table 5). Much of this State-to-State variation in the overall level of quality, especially in the factors of pure seed and inert matter, appears to have some relationship to the volume of the certified seed produced in the State and the importance of the crop in the farm and market operations. Only in the germination and weed seed categories does the percentage of samples that meet the highest requirements fall below 70 percent in a few of the States. The two States having

Table 4.--Average purity and germination of certified alfalfa seed, and variance of these factors, by minimum State requirements, 1955-57

Quality factor and minimum State purity requirement	1955		1956		1957	
	Average analysis 1/	Standard two-thirds range deviation 2/	Average analysis 1/	Standard two-thirds range deviation 2/	Average analysis 1/	Standard two-thirds range deviation 2/
	Percent	Percent	Percent	Percent	Percent	Percent
Purity analyses in States with minimum purity standards of:						
99.50 percent	99.85	99.64-99.96	99.84	99.67-99.97	99.83	99.67-99.96
99.25 percent	99.71	99.48-99.87	99.66	99.40-99.87	99.79	99.59-99.88
99.00 percent	99.82	99.60-99.96	99.89	99.73-99.98	99.86	99.73-99.97
98.00-98.50 percent	99.55	99.50-99.93	99.53	99.33-99.88	99.65	99.41-99.93
Germination analyses in States with minimum purity standards of:						
99.50 percent	93.59	91.89-96.99	93.83	89.99-98.33	93.50	89.90-97.36
99.25 percent	91.60	88.90-95.74	92.89	89.90-96.66	92.61	89.99-96.50
99.00 percent	90.72	87.20-94.99	91.80	88.45-95.45	91.52	88.54-95.60
98.00-98.50 percent	91.45	87.99-94.99	91.28	88.43-93.90	91.13	87.43-95.66

1/ Use of the median instead of the average would have made little difference since the State groups tended to retain the same relationships to each other during each of the years.

2/ Range determined by actual count of two-thirds of the observations below the mean and two-thirds above the mean.

Table 3.--Average analysis of quality factors of certified alfalfa seed and percentage of samples meeting the highest certified seed standards of any State, average 1955-57

State	Pure seed 99.50 percent 1/		Inert matter 0.50 percent 2/		Other crops 0.05 percent 2/		Weed seed 0.10 percent 2/		Germination 90.0 percent 1/	
	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
1	99.91	100	0.07	100	3/	99	0.02	95	93.8	89
2	99.90	99	.04	99	0.03	81	.03	94	92.1	80
3	99.87	99	.07	99	.01	93	.05	85	91.2	67
4	99.85	96	.10	97	.02	84	.03	93	91.0	66
5	99.81	100	.14	100	.01	96	.04	90	93.9	91
6	99.77	100	.15	100	.01	95	.07	76	93.3	77
7	99.74	85	.25	88	3/	98	.01	99	94.5	100
8	99.69	85	.18	89	.02	85	.11	57	90.8	78
9	99.69	82	.26	84	.01	94	.04	90	91.8	66
10	99.67	88	.30	93	3/	100	.03	94	91.6	73
11	99.66	75	.27	87	.01	97	.06	82	90.7	63
12	99.47	71	.50	79	3/	100	.02	100	91.0	60

1/ Minimum percentage allowed.
2/ Maximum percentage allowed.
3/ Less than 0.01 percent.

the lowest percentage of their samples meeting the requirements for purity and germination also tend to have the lowest standards.

NONCERTIFIED SEED REGULATIONS

Noncertified alfalfa seed generally has been subjected to few controls regarding the quality of seed that can be marketed. The Federal Seed Act and State seed laws informed the seed industry which items must appear on the tag and have made restrictions on other factors such as mislabeling and maximum weed seed content. In addition, each State has set forth additional limitations that must be adhered to by anyone offering seed for sale.

The State seed laws are meant primarily for regulatory purposes and are effective after the seed enters the marketing channel. These laws are essentially correct-labeling laws. This means that each container or bulk lot of seed must be labeled with certain basic information which must represent the seed analysis of each container or bulk lot of seed.

Requirements

In the State seed laws from the 12 States included in this study, restrictions to help control the quality of noncertified alfalfa seed were found to deal almost entirely with weed seeds. Limitations allowed at the time of marketing may vary by States up to a maximum of 5 percent by weight for secondary noxious weeds and common weed seeds.

Although few specific requirements for noncertified seed are spelled out and enforced, some private seed firms have their seed production fields inspected and supervised and have adopted seed analysis standards comparable to those for certified seed. As a result, a large volume of the best commercial brands of noncertified seed entering marketing channels is equal to or higher in quality than the State standards for certified seed.

All seed, however, is subject to some degree of quality control. Each State has an agency whose function, among other things, is to take samples periodically of all seed sold in the normal marketing channels. These samples are analyzed in the laboratory for each category listed on the tag. The results are compared with the tag analyses and the two must correspond. Most seed inspectors attempt to visit all seed establishments at least once a year.

The staffs of the various State seed departments apparently are performing all of the work assigned to them. However, here again, as for certified seed, lack of funds may have some effect on the scope of their activities. The men who are responsible for drawing the official seed samples must also inspect and take samples of feed, fertilizer, and various other commodities. Therefore, at times, some phase of their inspection activities suffers because of the inability to devote enough time to one commodity. In some States, unfortunately, seed usually receives the least emphasis; the result is that only a limited number of official samples are drawn. In some States much of the seed analysis

is conducted by agriculture students who have had several courses in agronomy. In other States this work is performed by permanent personnel. 10/

The bulk of the analysis work performed by the various offices was confined to the service samples. Usually during the busy season, there was a large backlog of service samples resulting in frequent delays in analyzing the official samples and forwarding the results to the sender.

Seed Analysis Records

During 1957 the number of official samples of alfalfa seed analyzed by the State seed laboratories varied from less than 50 to more than 350. Only limited information is available as to the exact number of samples that were found to be mislabeled. 11/ However, data from one State indicate that of the 231 official samples taken in 1957, 78 were not correctly labeled at the time the sample was taken. The most frequent violation occurred in the category of germination; weed seed was the second most frequent violation. This may or may not be representative of the official samples tested in the other States but it does indicate the importance of such sampling.

During 1957 the State seed laboratories also tested several hundred service samples. Information available from a few States indicates that from 172 to 800 samples of noncertified alfalfa seed were analyzed in 1957. Since much of this seed is not marketed in the same condition as is represented by these tests, service samples were excluded from the analysis wherever possible. In two States, where no analysis data could be obtained for official samples, service samples were used after analysis disclosed that their use did not influence the results appreciably.

NONCERTIFIED SEED COMPARED TO HIGHEST STANDARDS

Official samples of noncertified seed were compared with the highest State standards for certified seed. Noncertified seed, as a whole, compares favorably with these highest certified seed standards (table 6). In no State did the average analysis meet these high requirements in all categories. However, the analyses from only a few States show large differences from these standards.

For example, in the pure seed category, four of the nine States have averages above 99.50 percent and a fifth State averaged only 0.02 percent below the established standard. For all of the other categories except other crops, a similar situation exists. In the other crops category seven of the nine States failed to meet the established standard of 0.05 percent.

The approximate percentage of alfalfa seed that meets the established standards varies widely among the States for all of the categories that were

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10/ In a few of the States the same laboratory analyzed both certified and noncertified service and official seed samples.

11/ Mislabeled seed cannot be sold until the label has been corrected to coincide with the new analysis.

Table 6.--Average analysis of quality factors of noncertified alfalfa seed and percentage of samples meeting highest certified seed standards of any State, 1957

State 1/	Pure seed 99.50 percent 2/		Inert matter 0.50 percent 3/		Other crops 0.05 percent 3/		Weed seed 0.10 percent 3/		Germination 90.0 percent 2/	
	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard	Average analysis	Samples meeting this standard
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
1	99.87	100	0.12	100	0.001	100	0.01	98	89.9	54
2	99.67	86	.09	95	.15	50	.08	75	89.5	52
3	99.67	83	.09	100	.06	63	.07	85	89.6	50
4	99.67	79	.22	91	.06	69	.02	96	91.7	72
5	99.48	67	.26	91	.10	50	.15	59	90.3	52
6	99.40	52	.51	61	.01	98	.08	79	89.9	63
7	99.23	71	.42	94	.16	39	.19	67	90.1	59
8	99.17	52	.32	84	.28	45	.16	62	92.0	71
9	99.12	51	.49	96	.23	57	.18	64	90.3	55

1/ From official sample data only. The States excluded from this table had too few official samples to make a valid comparison possible. The number of reports included in our random sample ranged from a low of 35 in one State to a high of 178 in another.

2/ Minimum percentage allowed.

3/ Maximum percentage allowed.

analyzed. In only one category, other crop seeds, do any States have less than 50 percent of their samples equaling or exceeding the established requirements. For germination, the variation between the States is the least, with 50 to 72 percent of the samples meeting the germination requirement of 90.0 percent.

COMPARISON OF CERTIFIED AND NONCERTIFIED SEED

The average levels of purity and germination were somewhat lower for noncertified seed than for certified seed regardless of whether the State minimum purity standard is 99.5 percent or one ranging from 98 to 98.5 percent (table 7).

Table 7.--Average purity and germination of certified and noncertified alfalfa seed, and variance of these factors, 1957

Quality factor and minimum State purity requirement	Certified		Noncertified	
	Average analysis 1/	Standard two-thirds range deviation 2/	Average analysis 1/	Standard two-thirds range deviation 2/
	Percent	Percent	Percent	Percent
Purity analyses in States with minimum purity standards of:				
99.50 percent	99.83	99.67-99.96	99.23	98.10-99.60
99.25 percent	99.70	99.59-99.88	99.40	99.02-99.80
99.00 percent	99.86	99.73-99.97	99.45	98.78-99.84
98.00-98.50 percent	99.65	99.47-99.23	99.05	97.34-99.81
Germination analyses in States with minimum purity standards of:				
99.50 percent	93.50	89.90-97.36	91.03	86.53-95.72
99.25 percent	92.61	89.99-96.50	89.93	84.99-93.89
99.00 percent	91.52	88.54-95.60	90.18	85.99-94.99
98.00-98.50 percent	91.13	87.43-95.66	88.87	82.99-93.29

1/ Use of the median instead of the average would have made little difference in these comparisons since the median tended to exceed the mean in all instances except in States with purity standards of 98 to 98.50. In these States the type of distribution varied and comparisons are not as valid. Because of the absence of a lower limit for noncertified seeds a comparison of the medians tends to reduce slightly the small difference shown between certified and noncertified seeds.

2/ Range determined by actual count of two-thirds of the observations below the mean and two-thirds above the mean.

Possibly more important, however, is the fact that noncertified seed showed a greater variation of the individual lot analyses around these averages than does certified seed. Again this is true irrespective of the level of the purity standard in each State. Thus, the noncertified alfalfa seed marketed through the normal marketing channels in the producing States is less uniform in quality than the certified seed. Certain brands of noncertified seed, however, are much more consistent in maintaining a high level of quality than is true of noncertified seed in general.

Although table 7 indicates that there may be some direct relationship between the average quality of the alfalfa seed and the level of the State seed purity standard, a more detailed study indicates that this relationship is not very strong (table 8, for example, "other crop seeds"). Apparently the level of the State purity standards only indirectly influences the average quality by establishing a minimum. The fact that these minimums may be too low to be effective in most years may be the major reason for the small degree of association.

Naturally, this lack of relationship between certified seed standards and the average quality of seed produced also exists in the noncertified seeds marketed in these States (table 8).

Table 8 also reemphasizes the fact that the quality of the noncertified seed varies much more than does the quality of certified alfalfa seed. The overall average was discussed earlier but table 8 shows this greater variation for each of the factors considered in disclosing quality on the seed tag.

GEOGRAPHIC COMPARISONS

Certified alfalfa seed produced in the Pacific Coast States has a somewhat higher level of purity and contains less inert matter, weed seed, and other crop seed than does the certified seed produced in either the Mountain or the Plains States, (table 9). Germination analyses, however, show that the Mountain States produce seed with a germination equal to seed produced in the Pacific Coast States.

Noncertified alfalfa seed marketed in each of these areas shows the same pattern of regional differences. However, the germination analyses show little difference between regions, whereas the level of purity, inert matter, weed seed, and other crop seed contents nearly all indicate a quality advantage for the Pacific Coast States.

This means that the seed currently marketed from the Pacific Coast States has a tendency to be of a somewhat higher quality for the factors that can be controlled and measured. It does not mean, however, that the seed produced in the Mountain or Plains States is inferior since:

(1) Nearly all of the certified and most of the noncertified seed meets the highest composite certification standards.

Table 8.--Percentage distribution of samples of certified and noncertified alfalfa seed by ranges in quality factors, in States with specified purity standards, 1957

Ranges in quality factors	In States with minimum purity standards of--							
	99.50 percent		99.25 percent		99.00 percent		98.00-98.50 percent	
	Certified	Noncertified	Certified	Noncertified	Certified	Noncertified	Certified	Noncertified 1/
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Other crop seeds:								
None	60	40	90	67	71	39	98	68
0.01-.03 Pct.	12	13	5	7	12	9	0	7
.04-.06 Pct.	5	9	5	8	8	7	0	6
.07-.10 Pct.	1	4	0	7	4	10	2	6
Over .10 Pct.	0	34	0	11	5	35	0	13
Weed seeds:								
None	38	23	70	20	48	22	40	18
0.01-.05 Pct.	40	29	22	34	24	24	28	27
.06-.10 Pct.	10	15	6	17	12	16	17	15
Over .10 Pct.	12	33	2	29	16	38	15	40
Inert matter:								
Less than .10 Pct.	59	32	4	24	82	68	30	35
0.11-.20 Pct.	19	22	59	22	9	16	8	13
.21-.30 Pct.	11	10	11	10	5	7	10	12
.31-.40 Pct.	6	9	13	13	1	4	18	11
.41-.50 Pct.	5	7	4	5	1	2	22	9
Over .50 Pct.	0	20	9	26	2	3	12	20
Purity:								
99.80-100 Pct.	64	29	46	22	79	38	28	28
99.60-99.79 Pct.	25	22	34	24	17	25	25	26
99.40-99.59 Pct.	11	12	15	20	3	13	38	16
99.20-99.39 Pct.	0	13	5	16	0	8	9	5
99.00-99.19 Pct.	0	4	0	7	1	5	0	3
Less than 99.00 Pct.	0	20	0	11	0	11	0	22
Germination:								
97-100 Pct.	9	9	10	1	6	1	10	4
93-96 Pct.	43	30	45	22	36	26	23	24
89-92 Pct.	32	33	34	61	39	38	40	35
86-88 Pct.	16	18	9	9	18	22	27	22
80-85 Pct.	---	5	2	4	1	8	1	11
Under 80 Pct.	---	5	---	3	---	5	---	4

1/ Service samples were included in the three States for which the official samples were inadequate.

Table 9.--Percentage distribution of samples of certified and noncertified alfalfa seed by ranges in quality factors, by regions, 1957

Ranges in quality factors	Pacific Coast States 1/		Mountain States 2/		Plains States 3/	
	Certified	Noncertified	Certified	Noncertified 4/	Certified	Noncertified 4/
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Other crop seeds:						
None	89	53	73	38	73	64
0.01-.03 Pct.	1	6	19	14	20	6
.04-.06 Pct.	5	5	5	10	7	8
.07-.10 Pct.	2	6	2	6	0	7
Over .10 Pct.	3	30	1	32	2	15
Weed seeds:						
None	60	42	35	23	38	12
0.01-.05 Pct.	25	25	38	29	36	30
.06-.10 Pct.	7	13	13	16	10	17
Over .10 Pct.	8	20	14	32	16	41
Inert matter:						
Less than .10 Pct.	80	70	40	40	19	28
0.11-.20 Pct.	11	17	26	20	45	21
.21-.30 Pct.	6	4	13	10	5	11
.31-.40 Pct.	2	2	9	9	14	12
.41-.50 Pct.	1	3	8	6	9	5
Over .50 Pct.	0	4	4	15	8	23
Purity:						
99.80-100 Pct.	85	59	49	30	39	18
99.60-99.79 Pct.	14	21	33	25	29	25
99.40-99.59 Pct.	1	10	16	14	25	19
99.20-99.39 Pct.	0	4	2	12	6	14
99.00-99.19 Pct.	0	2	0	4	1	6
Less than 99.00 Pct.	0	4	0	15	0	18
Germination:						
97-100 Pct.	18	3	13	7	1	3
93-96 Pct.	42	27	47	32	34	22
89-92 Pct.	28	35	28	35	45	52
85-88 Pct.	12	24	12	18	18	12
80-84 Pct.	0	9	0	5	2	7
Under 80 Pct.	0	2	0	3	0	4

1/ California, Washington, and Oregon.
2/ Colorado, Montana, Idaho, Utah, and Wyoming.
3/ Kansas, Nebraska, Oklahoma, and South Dakota.
4/ Includes service samples in three States for which the official samples were inadequate.

(2) Germination, the only noncontrollable measure of quality, tends to be the same in all geographic areas.

(3) The levels of purity, inert matter, weed seed, and other crop seed, for which the Pacific Coast States show an advantage, are controllable through the number and efficiency of the cleaning operations performed.

Geographic differences in the quality of the alfalfa seed shown on the tag, therefore, may be rendered insignificant by the interaction of competition. The current differences between areas appear to be due primarily to the difference in the relative economic importance of seed production to farm producers and marketing firms in the different geographic areas.

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